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(54) PROCESSES IN WHICH MATTER IS SUBJECTED TO FLUID FLOW.

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Description

This invention relates to processes in which matter is subjected to fluid flow.

In our specification EP-B-68853 there is disclosed apparatus comprising a chamber having an annular fluid inlet disposed beneath an annular region in the chamber and means for directing fluid flow through the inlet into said annular region with vertical and circumferential flow components for moving a bed of matter in the chamber in a band along an annular path in the annular region as the fluid passes through the bed.

This apparatus may be used for treating the fluid and/or the matter as the fluid passes through the bed of matter. During the treatment of matter and/or fluid in this way the matter is continuously in the flow of fluid as it moves along the annular path. In certain processes such continuous subjection of the matter to the fluid flow can be disadvantageous.

Accordingly, the present invention provides a process in which matter is subjected to fluid flow, comprising providing a flow of fluid in a first annular region having vertical and circumferential flow components, providing a second annular region contiguous with and disposed outwardly of said first region, moving matter in a band continuously along an annular path said regions while circulating matter in said band between said regions such that said matter moves into and out of said flow during movement around said regions.

In a preferred embodiment of the invention to be described hereinafter the matter is moved out of the first annular region by centrifugal force and is returned from said second annular region to said first annular region by a slope in a wall means bounding said second annular region.

The process of the invention is particularly, but not exclusively, applicable where there is a heat transfer between the matter and the fluid flow.

The invention also includes apparatus for subjecting matter to fluid flow, comprising a chamber having an annular fluid inlet means disposed beneath a first annular region in the chamber, the chamber having a second annular region contiguous with and disposed outwardly of the first region between said first region and a circumferential wall means of the chamber, means for directing fluid flow through said inlet into said first annular region with vertical and circumferential flow components, and means for moving matter which has moved out of the flow in said first region into said second region by centrifugal force back into said first region, wherein said means for directing fluid through said inlet into said first annular region with vertical and circumferential flow components comprises an annular array of at least generally radially extending elongate passage means each of which is inclined such that flow upwardly through said

passage means exits with a circumferential flow component.

In the preferred embodiment the circumferential wall means extends upwardly and is disposed radially outwardly, of said annular fluid inlet means, at least a portion of said wall means having a slope towards said annular fluid inlet means whereby said chamber has said first annular region above said annular fluid inlet means and said second annular region between said first region and said wall means and said means for moving matter back into said first region comprises the slope of said wall means.

The slope may extend downwardly to the outer edge of the annular fluid inlet means.

5 The circumferential wall means may comprise a cylindrical portion extending upwardly from a portion having said slope.

10 The chamber may include second circumferential wall means extending upwardly, and disposed radially inwardly, of said annular fluid inlet means.

15 This second circumferential wall means may comprise at least a portion having a slope towards said annular fluid inlet means, which slope may extend to the radially inner edge of said annular fluid inlet means.

20 The annular array of passage means may be provided in an annular wall portion, and for example each passage means may comprise a slot extending through said wall portion, both of the at least generally radially extending side surfaces of the slot being inclined circumferentially.

25 The annular array of passage means may be disposed beneath said annular fluid inlet means and said flow directing means may further comprise respective flow guiding means extending upwardly between said array and locations at or adjacent radially inner and outer edges of said annular inlet means for causing flow through said array to be confined substantially to said first region in the chamber.

30 35 One or each of said flow guiding means may comprise aperture means for directing fluid flow into the flow through said array. Preferably said one or each flow guiding means comprises a circumferential wall portion provided with said aperture means. These aperture means may comprise circumferentially spaced apart elongate apertures, preferably each having at least one side surface which is inclined such that flow therethrough exits with a circumferential flow component. Preferably these elongate apertures extend upwardly.

40 45 50 55 The invention also includes an apparatus for subjecting matter to fluid flow, comprising a chamber having an annular fluid inlet means disposed beneath a first annular region in the chamber, the chamber having a second annular region contiguous with and disposed outwardly of the first region between said first region and a circumferential wall means of the chamber, means for directing fluid flow through said

inlet into said first annular region with vertical and circumferential flow components, and means for moving matter which has moved out of the flow in said first region into said second region by centrifugal force back into said first region, said fluid flow directing means including flow guiding means for causing fluid flow through said inlet to be confined substantially to said first annular region.

In order that the invention may be better understood, an embodiment thereof, which is given by way of example only, will now be described with reference to the accompanying drawings, in which:

- Figure 1 is a schematic axial cross-section of part of an apparatus for subjecting matter to fluid flow;
- Figure 2 is a cross-section along the line II-II of Figure 1; and
- Figure 3 is a perspective view of a radial portion of the apparatus.

Referring first to Figures 1 and 2, the illustrated apparatus comprises a chamber 10 having a circumferential wall 12 which is disposed radially outwardly of an annular fluid inlet 14. The wall 12 slopes towards the annular fluid inlet, and as shown comprises a cylindrical portion 16 extending upwardly from a sloping portion 18. In the illustrated apparatus, the sloping portion 18 extends downwardly to the outer edge 20 of the annular fluid inlet.

Within the chamber 10 there is a first annular region disposed above the annular fluid inlet and designated 22 in Figure 1 and a second annular region 24 contiguous with the first annular region and disposed between that region and the circumferential wall 12. The second region is disposed above the sloping portion 18 of the wall in the embodiment.

The apparatus also includes means for directing fluid through the annular inlet 14 with vertical and circumferential flow components. The direction of the fluid flow through the inlet is indicated in Figure 1 and Figure 3 by arrows 26 and 28. The flow of fluid through the inlet is such that it will move matter in the chamber 10 in a band continuously along an annular path in the regions 22, 24. This matter is moved vertically and circumferentially whilst in the first region 22 by the flow of fluid therein, is moved out of this flow of fluid in the first region into the second region by circumferential force and is directed back into the first region by the slope 18. The movement of the matter into and out of the flow of fluid is indicated by arrows 30 in Figures 1 and 3. It will be understood that whilst the matter is being circulated as indicated by arrows 30 it is also moving in the circumferential direction. Furthermore, it will be understood that when the matter moves into the outer annular region 24 it is not subjected therein to the flow of the fluid and falls under gravity towards the annular inlet 14 whereupon it re-enters the fluid flow and is moved circumferentially and vertically by the fluid flow therein.

The fluid exits the chamber 10 upwardly as indi-

cated by arrows 32 after it has passed through the annular region 22.

In the illustrated apparatus the chamber 10 includes a second circumferential wall 34 extending upwardly and disposed radially inwardly of the annular fluid inlet 14. This circumferential wall 34 has a slope towards the annular fluid inlet such that matter introduced centrally into the chamber as indicated by arrows 36 will be directed into the first annular region 22 above the annular fluid inlet 14. Whilst the whole of the second circumferential wall is provided with such a slope in the embodiment and this slope extends to the radially inner edge 38 of the annular fluid inlet 14, it is to be understood that only a portion of the circumferential wall 34 need be provided with such a slope and that slope need not extend to the edge 38.

Referring now particularly to Figure 3, the means for directing fluid through the annular inlet 14 with vertical and circumferential flow components in the illustrated apparatus comprises an annular array of at least generally radially extending elongate passages 40. A portion of the annular array of passages is illustrated in Figure 2, however it is to be understood that the array extends completely around the annular inlet 14. Each passage 40 has at least one side surface which is inclined such that flow upwardly through the passage will exit with a circumferential flow component. In the illustrated apparatus the passages 40 are provided in an annular wall portion 42 and each passage comprises a slot extending through the wall portion, with both of the at least generally radially extending side surfaces 44, 46 of each slot being inclined in the circumferential direction. As shown the slots 40 and their side surfaces 44, 46 extend radially.

In order to cause the flow through the array of slots 40 to be confined substantially to the annular region above the fluid inlet 14, the flow directing means further comprises respective flow guiding means, generally indicated at 48 and 50 in Figure 3, extending upwardly between the array of slots 40 and locations at or adjacent the radially inner and outer edges 38, 20 of the annular inlet 14.

In the illustrated apparatus each flow guiding means 48, 50 comprises aperture means for directing fluid flow into the flow through the array of slots 40. In Figures 1 and 3, the flow through the array is indicated by arrows 26 whilst the flow through the guiding means is indicated by arrows 28. It will be appreciated that the flow through the guiding means 48 has a radially outwardly as well as a circumferential component and the flow through the guiding means 50 has a radially inwardly as well as a circumferential flow component. Accordingly the respective flows through the guiding means 48 and 50 confine the flow through the array of slots 40 substantially to the annular region above the slots 40 and prevent the flow contacting the edges 20, 38 of the annular inlet 14.

The flow guiding means 48, 50 each comprises

a circumferential wall portion provided with apertures 52 which are circumferentially spaced apart elongate apertures, having at least one side surface which is inclined such that the flow therethrough exits with a circumferential flow component as well as a radial flow component. In the illustrated apparatus the elongate apertures extend upwardly from the ends of slots 40.

The illustrated apparatus is particularly applicable for use in heating matter comprising a particulate material which has to be heated to a predetermined temperature, but which is adversely affected by being continuously subjected to temperatures above that predetermined temperature during treatment.

In such an application a flow of heated fluid is provided to the first annular region 22 in the chamber 10 with vertical and circumferential components by virtue of its passage through the slots 40 and the apertures 52. The particulate matter to be heated is supplied to the chamber centrally thereof and is fed to the region 22 by the slope of the inner circumferential wall 34. This particulate material is then moved in a band continuously along an annular path in the regions 22 and 24. The particulate material is moved vertically and circumferentially by the fluid flow whilst in the first region, is moved out of the flow in the first region into the second region by circumferential force and is thereafter directed back into the first region by the slope 18 of the outer circumferential wall 12. Thus, the particulate material is moved in a band continuously around the regions 22, 34 whilst being circulated in this band between the regions such that the material moves into and out of the heated flow during movement around the regions. The fluid may be heated prior to and/or subsequent to its passage through the inlet 14. For example the fluid may comprise combustion gases, the combustion region of which is totally below the annular inlet 14, is totally above the annular 14 or which spans the annular inlet 14.

It will be understood that alternative means to the provision of a slope such as slope 18, on the outer circumferential wall 16 may be provided for moving matter from annular region 24 back into annular region 22. For example, it is envisaged that such alternative means may comprise a plurality of fluid jets disposed around the outer circumferential wall and directed inwardly with at least a radial flow component for this purpose.

Claims

1. A process in which matter is subjected to fluid flow, comprising providing a flow of fluid in a first annular region having vertical and circumferential flow components, providing a second annular region contiguous with and disposed outwardly of said first region, moving matter in a band contin-

uously along an annular path in said regions while circulating matter in said band between said regions such that said matter moves into and out of said flow during movement around said regions.

5. 2. A process as claimed in claim 1, wherein said matter is moved out of said first annular region by centrifugal force.
10. 3. A process as claimed in claim 1 or 2, wherein matter is returned from said second annular region to said first annular region by a slope in a wall means bounding said second annular region.
15. 4. A process as claimed in any one of the preceding claims, wherein there is a heat transfer between said matter and fluid flow.
20. 5. Apparatus for subjecting matter to fluid flow, comprising a chamber having an annular fluid inlet means disposed beneath a first annular region in the chamber, the chamber having a second annular region contiguous with and disposed outwardly of the first region between said first region and a circumferential wall means of the chamber, means for directing fluid flow through said inlet into said first annular region with vertical and circumferential flow components, and means for moving matter which has moved out of the flow in said first region into said second region by centrifugal force back into said first region, wherein said means for directing fluid through said inlet into said first annular region with vertical and circumferential flow components comprises an annular array of at least generally radially extending elongate passage means each of which has at least one side surface which is inclined such that flow upwardly through said passage means exits with a circumferential flow component.
25. 35. 6. Apparatus as claimed in claim 5 wherein said circumferential wall means extends upwardly, and is disposed radially outwardly, of said annular fluid inlet means, at least a portion of said wall means having a slope towards said annular fluid inlet means whereby said chamber has said first annular region above said annular fluid inlet means and said second annular region between said first region and said wall means and said means for moving matter back into said first region comprises the slope of said wall means.
30. 40. 7. Apparatus as claimed in claim 6, wherein said slope extends downwardly to the outer edge of said annular fluid inlet means.
35. 8. Apparatus as claimed in claim 6 or 7, wherein

- said circumferential wall means comprises a cylindrical portion extending upwardly from a portion having said slope.
9. Apparatus as claimed in any one of claims 5 to 8, wherein said chamber includes second circumferential wall means extending upwardly, and disposed radially inwardly, of said annular fluid inlet means. 5
10. Apparatus as claimed in claim 9, wherein said second circumferential wall means comprises at least a portion having a slope towards said annular fluid inlet means. 10
11. Apparatus as claimed in claim 10, wherein said slope extends to the radially inner edge of said annular fluid inlet means. 15
12. Apparatus as claimed in any one of claims 5 to 11, wherein said passage means are provided in an annular wall portion, 20
13. Apparatus as claimed in claim 12, wherein each passage means comprises a slot extending through said wall portion, both of the at least generally radially extending side surfaces of the slot being inclined circumferentially. 25
14. Apparatus as claimed in any one of claims 5 to 13, wherein said annular array of passage means is disposed beneath said annular fluid inlet means and said flow directing means further comprises respective flow guiding means extending upwardly between said array and locations at or adjacent radially inner and outer edges of said annular inlet means for causing flow through said array to be confined substantially to said first region in the chamber. 30
15. Apparatus as claimed in claim 14, wherein one or each of said flow guiding means comprises aperture means for directing fluid flow into the flow through said array. 35
16. Apparatus as claimed in claim 15, wherein said one or each flow guiding means comprises a circumferential wall portion provided with said aperture means. 40
17. Apparatus as claimed in claim 15 or 16, wherein said aperture means comprise circumferentially spaced apart elongate apertures. 50
18. Apparatus as claimed in claim 17, wherein said apertures each have at least one side surface which is inclined such that flow therethrough exits with a circumferential flow component. 55
19. Apparatus as claimed in claim 17 or 18, wherein said elongate apertures extend upwardly.
20. Apparatus for subjecting matter to fluid flow, comprising a chamber having an annular fluid inlet means disposed beneath a first annular region in the chamber, the chamber having a second annular region contiguous with an disposed outwardly of the first region between said first region and a circumferential wall means of the chamber, means for directing fluid flow through said inlet into said first annular region with vertical and circumferential flow components, and means for moving matter which has moved out of the flow in said first region into said second region by centrifugal force back into said first region, said fluid flow directing means including flow guiding means for causing fluid flow through said inlet to be confined substantially to said first annular region. 60

Patentansprüche

1. Verfahren, bei dem ein Stoff einer Fluid-Strömung ausgesetzt bzw. mit dieser beaufschlagt wird, bei dem:
in einem ersten ringförmigen Bereich eine Strömung eines Fluids mit vertikalen und in Umfangsrichtung gerichteten Komponenten geschaffen wird;
ein an den ersten Bereich angrenzender zweiter Bereich, der außerhalb des ersten Bereichs angeordnet ist, vorgesehen wird, und
der Stoff in einem Band kontinuierlich entlang eines ringförmigen Pfades in den Bereichen bewegt wird, während der Stoff in dem Band zwischen den Bereichen so zirkuliert, daß sich der Stoff in die Strömung hinein und aus der Strömung heraus während der Bewegung um diese Bereiche herum bewegt.
2. Verfahren nach Anspruch 1, bei dem der Stoff über die Zentrifugalkraft aus dem ersten ringförmigen Bereich herausbewegt wird.
3. Verfahren nach Anspruch 1 oder 2, bei dem der Stoff von dem zweiten ringförmigen Bereich in den ersten ringförmigen Bereich über eine Schräge in einer Wandungseinrichtung zurückgeführt wird, die den zweiten ringförmigen Bereich begrenzt.
4. Verfahren nach einem der vorangehenden Ansprüche, bei dem eine Wärmeübertragung zwischen dem Stoff und der Fluidströmung stattfindet.

5. Vorrichtung zur Beaufschlagung von Stoffen mit einer Fluidströmung, welche aufweist:
eine Kammer, mit einer ringförmigen Fluid-Einlaßeinrichtung, die unterhalb eines ersten ringförmigen Bereichs in der Kammer angeordnet ist, wobei die Kammer einen an den ersten Bereich angrenzenden zweiten ringförmigen Bereich aufweist, der außerhalb des ersten Bereichs zwischen dem ersten Bereich und einer Umfangswandung der Kammer angeordnet ist, eine Einrichtung zum Richten der Fluidströmung durch den Einlaß in den ersten ringförmigen Bereich mit vertikalen und in Umfangsrichtung gerichteten Strömungskomponenten, und Mittel zum Bewegen des Stoffes, der aus der Strömung in dem ersten Bereich durch die Zentrifugalkräfte in den zweiten Bereich bewegt wurde, zurück in den ersten Bereich, wobei die Einrichtung zum Richten des Fluids durch den Einlaß hindurch in den ersten ringförmigen Bereich mit vertikalen und in Umfangsrichtung gerichteten Strömungskomponenten eine ringförmige Aneinanderreihung von zumindest im allgemeinen sich radial erstreckenden, länglichen Durchtrittseinrichtungen aufweist, von denen jede mindestens eine Seitenoberfläche aufweist, die so angestellt ist, daß die Aufwärts-Strömung durch die Durchtrittseinrichtungen mit einer in Umfangsrichtung gerichteten Strömungskomponente entweicht.
6. Vorrichtung nach Anspruch 5, bei der sich die Umfangswandung nach oben bezüglich der ringförmigen Einlaßeinheit erstreckt und radial außerhalb davon angeordnet ist, wobei mindestens ein Abschnitt der Wandung eine Schräge zur ringförmigen Fluid-Einlaßeinrichtung aufweist, so daß die Kammer einen ersten ringförmigen Bereich oberhalb der ringförmigen Einlaßeinrichtung und einen zweiten ringförmigen Bereich zwischen dem ersten Bereich und der Wandung aufweist, und wodurch die Einrichtung zum Bewegen des Stoffes zurück in dem ersten Bereich die Schräge der Wandung aufweist.
7. Vorrichtung nach Anspruch 6, bei der sich die Schräge nach unten zum äußeren Rand der ringförmigen Fluid-Einlaßeinrichtung erstreckt.
8. Vorrichtung nach Anspruch 6 oder 7, bei der die Umfangswandung einen zylindrischen Abschnitt aufweist, der sich von einem die Schräge aufweisenden Abschnitt nach oben erstreckt.
9. Vorrichtung nach einem der Ansprüche 5 bis 8, bei der die Kammer eine zweite Umfangswandung umfaßt, welche sich bezüglich der ringförmigen Fluid-Einlaßeinrichtung nach oben er-
- streckt, sowie radial innenliegend angeordnet ist.
10. Vorrichtung nach Anspruch 9, bei der die zweite Umfangswandung zumindest einen Abschnitt mit einer Schräge auf die ringförmige Fluid-Einlaßeinrichtung zu aufweist.
11. Vorrichtung nach Anspruch 10, bei der sich die Schräge zum radial inneren Rand der ringförmigen Fluid-Einlaßeinrichtung erstreckt.
12. Vorrichtung nach einem der Ansprüche 5 bis 11, bei der die Durchtrittseinrichtungen in einem ringförmigen Wandabschnitt vorgesehen sind.
13. Vorrichtung nach Anspruch 12, bei der jede Durchtrittseinrichtung einen sich durch den Wandabschnitt erstreckenden Schlitz aufweist, wobei beide der sich im wesentlichen radial erstreckenden Seitenoberflächen des Schlitzes in Umfangsrichtung geneigt bzw. angestellt sind.
14. Vorrichtung nach einem der Ansprüche 5 bis 13, bei der die ringförmige Reihe oder Aneinanderreiheung von Durchtrittseinrichtungen unterhalb der ringförmigen Fluid-Einlaßeinrichtung angeordnet ist und die Einrichtung zum Richten der Strömung zusätzlich entsprechende Strömungs-Führungseinrichtungen aufweist, die sich zwischen der Reihe und Stellen an oder angrenzend zu den radial inneren und äußeren Rändern der ringförmigen Einlaßeinrichtung erstrecken, um zu bewirken, daß die Strömung durch die Reihe im wesentlichen auf den ersten Bereich in der Kammer beschränkt bleibt.
15. Vorrichtung nach Anspruch 14, bei der eine oder jede der Strömungs-Führungseinrichtungen eine Öffnungseinrichtung zum Richten der Fluidströmung hinein in die Strömung durch die Reihe aufweist.
16. Vorrichtung nach Anspruch 15, bei der eine oder jede der Strömungs-Führungseinrichtungen einen Umfangswandabschnitt aufweist, der mit der Öffnungseinrichtung versehen ist.
17. Vorrichtung nach Anspruch 15 oder 16, bei der die Öffnungseinrichtung eine in Umfangsrichtung beabstandete längliche Öffnungen aufweist.
18. Vorrichtung nach Anspruch 17, bei der jede der Öffnungen zumindest eine Seitenoberfläche aufweist, die so geneigt oder angestellt ist, daß die hindurchtretende Strömung mit einer in Umfangsrichtung gerichteten Strömungskomponente entweicht.

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| 19. | Vorrichtung nach Anspruch 17 oder 18, bei der sich die länglichen Öffnungen nach oben erstrecken. | |
| 20. | Vorrichtung zur Beaufschlagung eines Stoffes mit einer Fluidströmung, welche aufweist:
eine Kammer mit einer ringförmigen Fluid-Einlaß-einrichtung, die unterhalb eines ersten ringförmigen Bereich in der Kammer angeordnet ist, wobei die Kammer einen zweiten ringförmigen Bereich aufweist, der angrenzend zu und außerhalb des ersten Bereichs zwischen dem ersten Bereich und der Umfangswandung der Kammer angeordnet ist,
einer Einrichtung zum Richten einer Fluidströmung durch den Einlaß in den ersten ringförmigen Bereich mit vertikalen und in Umfangsrichtung gerichteten Stömungskomponenten, und
einer Einrichtung zum Bewegen des Stoffes, der sich aus der Strömung in dem ersten Bereich durch die Zentrifugalkräfte in den zweiten Bereich bewegt hat, zurück in den ersten Bereich, wobei
die Einrichtung zum Richten der Fluid-Strömung eine Strömungs-Führungseinrichtung beinhaltet, um zu bewirken, daß die Fluidströmung durch den Einlaß hindurch im wesentlichen auf den ersten ringförmigen Bereich beschränkt bleibt. | 5
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| | 4. Procédé tel que défini dans l'une quelconque des revendications précédentes, dans lequel il y a un transfert de chaleur entre ladite matière et ledit écoulement de fluide. | |
| | 5. Appareil pour soumettre une matière à un écoulement de fluide, comprenant une chambre qui possède un moyen formant orifice d'entrée de fluide annulaire disposé au-dessous d'une première zone annulaire de la chambre, la chambre possédant une seconde zone annulaire contiguë à la première zone et disposée à l'extérieur de celle-ci, entre ladite première zone et un moyen formant paroi circonférentielle de la chambre, des moyens destinés à diriger un écoulement de fluide à travers ledit orifice d'entrée dans ladite première zone annulaire comportant des composantes d'écoulement verticale et circonférentielle, et des moyens destinés à ramener dans ladite première zone la matière qui est sortie de l'écoulement de ladite première zone dans ladite seconde zone sous l'effet d'une force centrifuge, dans lequel lesdits moyens destinés à diriger un fluide à travers ledit orifice d'entrée dans ladite première zone annulaire comportant des composantes d'écoulement verticale et circonférentielle comprennent un réseau annulaire de moyens formant passages allongés qui s'étendent au moins | |

Revendications

1. Procédé selon lequel une matière est soumise à un écoulement de fluide, consistant à prévoir un écoulement de fluide dans une première zone annulaire comportant des composantes d'écoulement verticale et circonférentielle, à prévoir une seconde zone annulaire contiguë à ladite première zone et disposée à l'extérieur de celle-ci, à déplacer en continu la matière sous la forme d'une bande le long d'une trajectoire annulaire dans lesdites zones tout en faisant circuler la matière sous la forme de ladite bande entre lesdites zones, de telle façon que ladite matière entre et sorte dudit écoulement pendant sa circulation dans lesdites zones.

2. Procédé tel que défini dans la revendication 1, dans lequel ladite matière est amenée à sortir de ladite première zone annulaire sous l'effet d'une force centrifuge.

3. Procédé tel que défini dans la revendication 1 ou 2, dans lequel la matière est ramenée de ladite seconde zone annulaire dans ladite première zone annulaire par une inclinaison définie dans un moyen formant paroi qui délimite ladite seconde zone annulaire.

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4. Appareil tel que défini dans la revendication 5, dans lequel ledit moyen formant paroi circonférentielle s'étend vers le haut et est disposé à l'extérieur radialement par rapport audit moyen formant orifice d'entrée de fluide annulaire, une partie au moins dudit moyen formant paroi présentant une inclinaison vers ledit moyen formant orifice d'entrée de fluide annulaire, pour qu'ainsi ladite chambre ait ladite première zone annulaire disposée au-dessus dudit moyen formant orifice d'entrée de fluide annulaire et ladite seconde zone annulaire disposée entre ladite première zone et ledit moyen formant paroi, et lesdits moyens destinés à ramener la matière dans ladite première zone comportent l'inclinaison dudit moyen formant paroi.

5. Appareil tel que défini dans la revendication 6, dans lequel ladite inclinaison s'étend vers le bas jusqu'au bord extérieur dudit moyen formant orifice d'entrée de fluide annulaire.

6. Appareil tel que défini dans la revendication 6 ou

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- 7, dans lequel ledit moyen formant paroi circonférentielle comprend une partie cylindrique qui s'étend vers le haut depuis une partie comportant ladite inclinaison.

9. Appareil tel que défini dans l'une quelconque des revendications 5 à 8, dans lequel ladite chambre comprend un second moyen formant paroi circonférentielle qui s'étend vers le haut et est disposé à l'intérieur radialement par rapport audit moyen formant orifice d'entrée de fluide annulaire.

10. Appareil tel que défini dans la revendication 9, dans lequel ledit second moyen formant paroi circonférentielle comprend au moins une partie comportant une inclinaison vers ledit moyen formant orifice d'entrée de fluide annulaire.

11. Appareil tel que défini dans la revendication 10, dans lequel ladite inclinaison s'étend jusqu'au bord intérieur radialement dudit moyen formant orifice d'entrée de fluide annulaire.

12. Appareil tel que défini dans l'une quelconque des revendications 5 à 11, dans lequel lesdits moyens formant passages sont prévus dans une partie de paroi annulaire.

13. Appareil tel que défini dans la revendication 12, dans lequel chaque moyen formant passage comprend une fente qui s'étend à travers ladite partie de paroi, les deux surfaces latérales de la fente qui s'étendent au moins sensiblement radialement étant inclinées circonférentiellement.

14. Appareil tel que défini dans l'une quelconque des revendications 5 à 13, dans lequel ledit réseau annulaire de moyens formant passages est disposé au-dessous dudit moyen formant orifice d'entrée de fluide annulaire et lesdits moyens de direction d'écoulement comprennent, en outre, des moyens de guidage d'écoulement respectifs qui s'étendent vers le haut entre ledit réseau et des emplacements situés au niveau ou à proximité radialement de bords intérieur et extérieur dudit moyen formant orifice d'entrée annulaire pour obliger l'écoulement à travers ledit réseau à être confiné sensiblement à ladite première zone de la chambre.

15. Appareil tel que défini dans la revendication 14, dans lequel l'un ou chacun desdits moyens de guidage d'écoulement comprend des moyens formant ouvertures destinés à diriger un écoulement de fluide dans l'écoulement établi à travers ledit réseau.

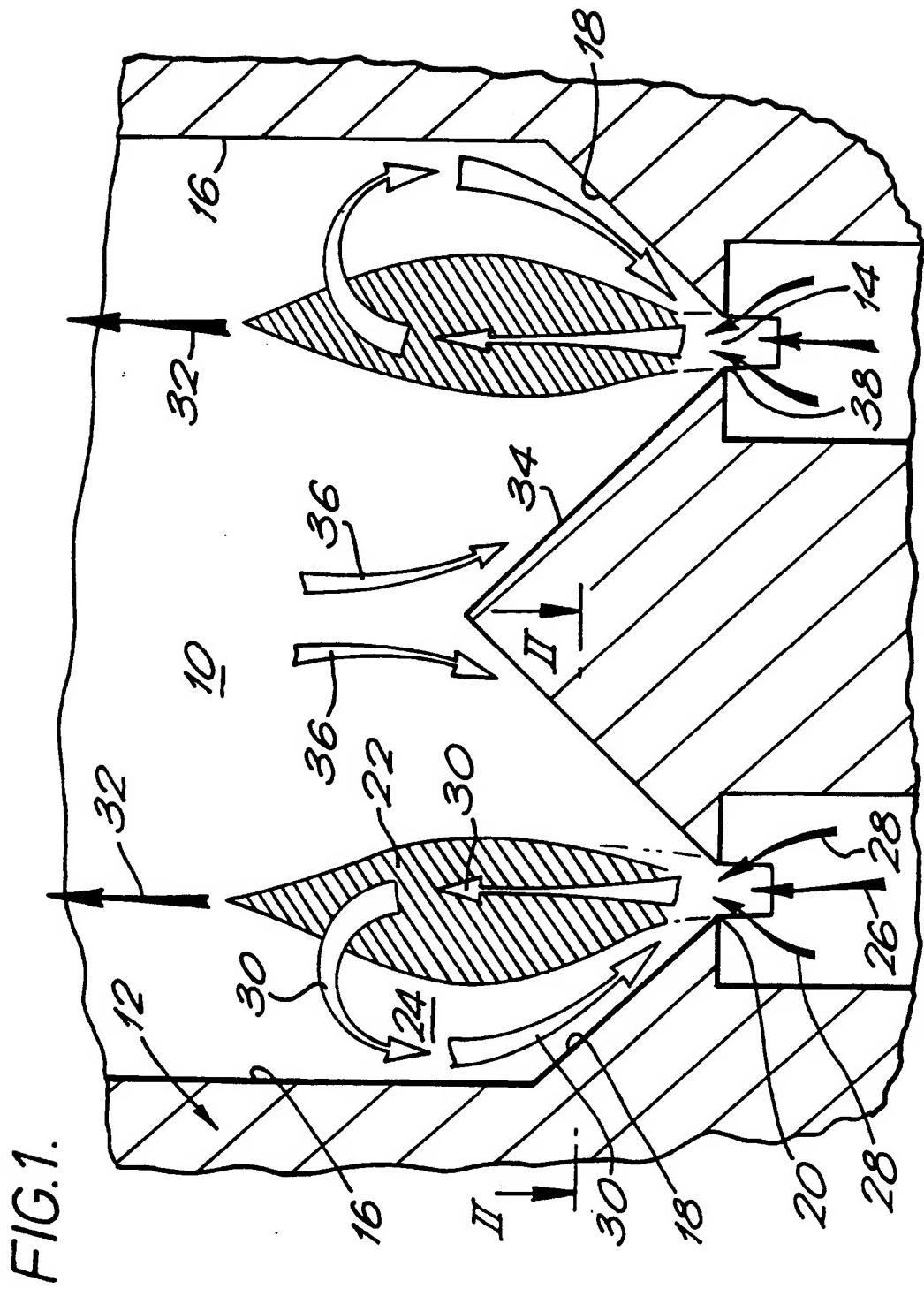
16. Appareil tel que défini dans la revendication 15, dans lequel chacun desdits moyens de guidage d'écoulement comprend une partie de paroi circonférentielle pourvue desdits moyens formant ouvertures.

17. Appareil tel que défini dans la revendication 15 ou 16, dans lequel lesdits moyens formant ouvertures comprennent des ouvertures allongées espacées les unes des autres circonférentiellement.

18. Appareil tel que défini dans la revendication 17, dans lequel lesdites ouvertures présentent chacune au moins une surface latérale inclinée de telle façon qu'un écoulement à travers elles ressort avec une composante d'écoulement circonférentielle.

19. Appareil tel que défini dans la revendication 17 ou 18, dans lequel lesdites ouvertures allongées s'étendent vers le haut.

20. Appareil pour soumettre une matière à un écoulement de fluide, comprenant une chambre qui possède un moyen formant orifice d'entrée de fluide annulaire disposé au-dessous d'une première zone annulaire de la chambre, la chambre possédant une seconde zone annulaire contiguë à la première zone et disposée à l'extérieur de celle-ci, entre ladite première zone et un moyen formant paroi circonférentielle de la chambre, des moyens destinés à diriger un écoulement de fluide à travers ledit orifice d'entrée dans ladite première zone annulaire comportant des composantes d'écoulement verticale et circonférentielle, et des moyens destinés à ramener dans ladite première zone la matière qui est sortie de l'écoulement de ladite première zone dans ladite seconde zone sous l'effet d'une force centrifuge, lesdits moyens de direction d'écoulement de fluide comprenant des moyens de guidage d'écoulement destinés à obliger l'écoulement de fluide à travers ledit orifice d'entrée à être confiné sensiblement à ladite première zone annulaire.



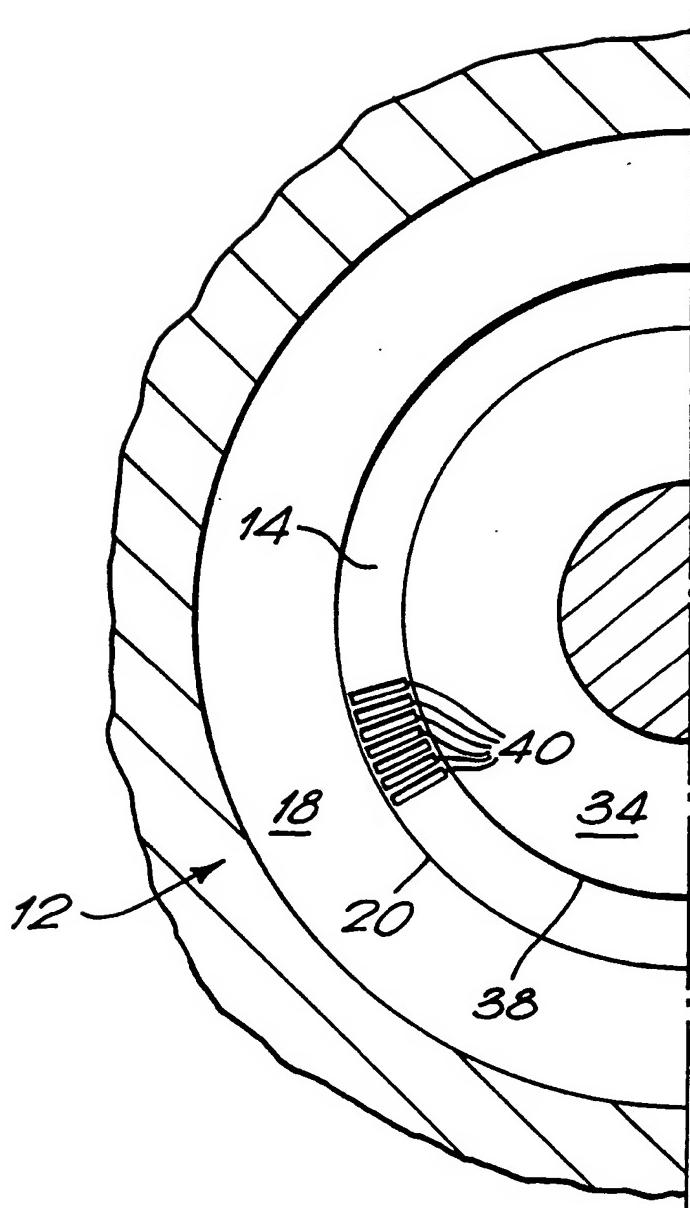


FIG. 2.

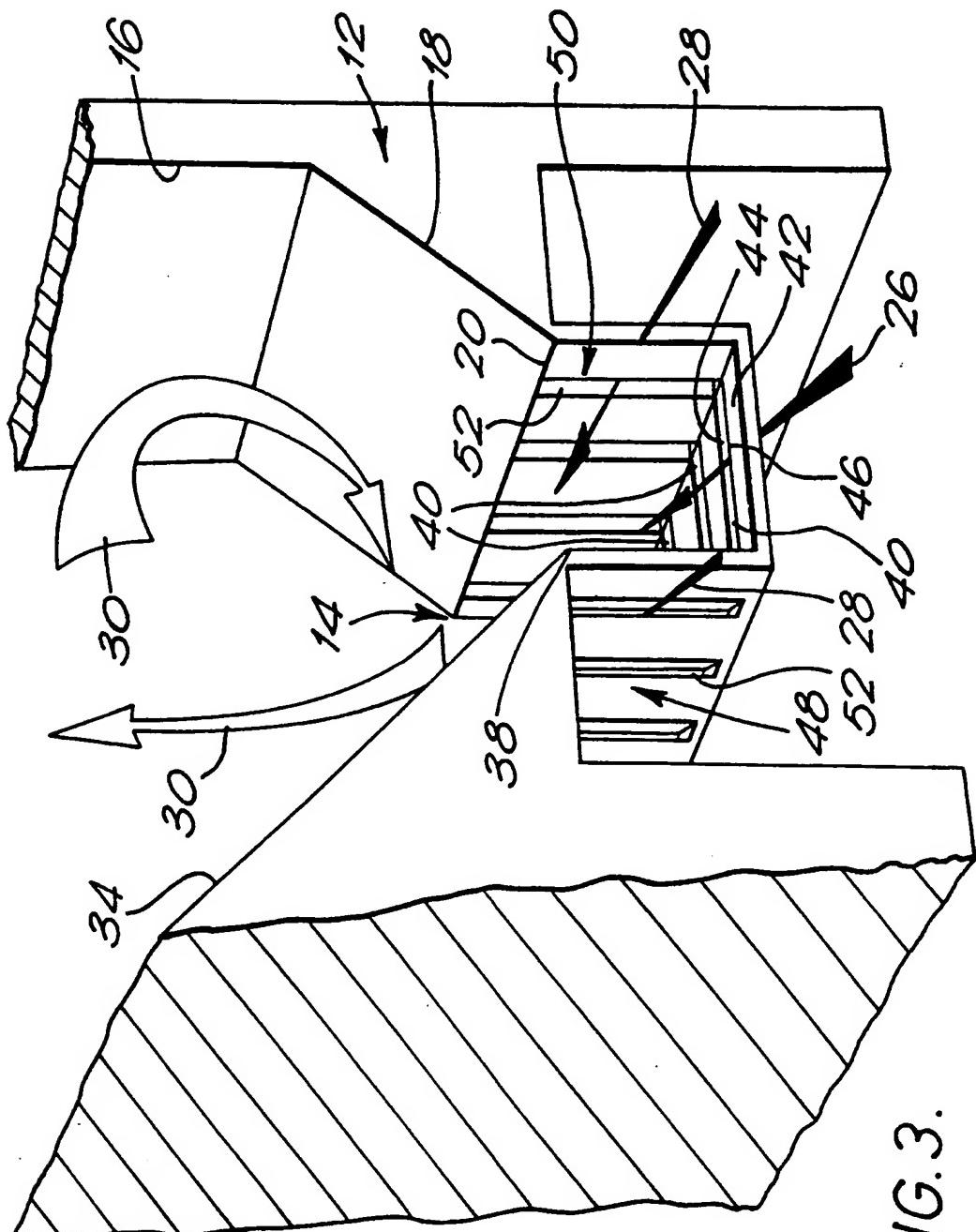


FIG. 3.